4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Climate

None of the project alternatives would have any effect on climate.

4.2 Geology and Soils

There would be no significant impacts to geology or soils with any of the project alternatives. No earth moving or construction activities are associated with Alternatives 1 through 5, and surface water patterns would not change to the degree that would cause any alterations in soils or groundwater recharge. Alternative 6 would require some excavation with construction of a 240 acre seepage reservoir. However, exposure of the soils would be short-term, and impacts would be minor and temporary. Appropriate erosion and sedimentation control measures would be incorporated and applied to construction efforts.

4.3 Hydrology

To help visualize the changes to hydrology and performance measures, a large number of color figures were provided in Appendix H. However, there are many more figures which would be of interest on our website: www.saj.usace.army.mil on the Sparrow Issues page.

One of the performance measures of interest in the WCA is the number of weeks the water depth would be above 2.5 feet (relative to the average ground elevation). There are 1612 weeks in the modeling period of record (from 1965 through 1995). Under RPA102, for example, there were 602 weeks depths greater than 2.5 feet as compared to 504 for the 95BaseMod condition and 475 weeks for the No Action Alternative condition in southern WCA 3A.

Reasonable and Prudent Alternatives (RPAs)

The RPA, as given the, could not be directly implemented because releases from S-333 are currently limited by high stage criteria at G-3273. Furthermore, higher canal stages in L-31N, as envisioned in Test 7 Phase II, depended upon the full use of the S-332D pump station. Under the USFWS BO, S-332D pump station was limited during the nesting season (165cfs instead of 500cfs). The effect of Test 7 Phase II, as given in the USFWS BO can be seen in Table H71 (for example) in some areas within South Dade. For example, the maximum stage reached in cell R17C27 would have been about 0.48 feet higher under RPA102 (7.18 feet) than in the 1995BaseMod condition (6.70 feet). It should also be noted that increasing the flows southward down L-31N in addition to raising canal pump criteria results in higher stages than simply raising the canal pump criteria alone. Under ISOP, additional water is moved down L-31N to help meet the S-333 release requirements. Under the RPA102, more water would enter L-31N due to increase seepage from the higher stages in NESRS. The

target flows for RPA102 and RPA130 were 60% and 30%, respectively, of the regulatory release through S-333, when not limited by structural capacity, into NESRS. Although the RPAs were could not be directly implemented, several RPAs were modeled to determine the desired hydrologic characteristics in the sparrow regions. RPA102 best represents the sparrow requirements for the eastern subpopulations while RPA130 best represents the sparrow requirements for the western subpopulations. No single RPA was found that met the USFWL BO requirements for both the eastern and western CSSS subpopulations simultaneously. Detailed descriptions of the RPA model runs can be found on the Corps web site.

Alternative 1 (No Action).

NESRS. The structure that provides flow to NESRS area is S-333 via the L-29 borrow canal and culverts beneath Tamiami Trail. Operation of the structure is partially controlled by a trigger gage (G-3273). For the No Action Alternative, when the G-3273 gage is less than 6.8 feet the S-333 structure provides the NESRS rainfall plan target of 55 percent of the total computed rainfall plan total, up to the structural capacity of 1350 cfs, which includes regulatory discharges when WCA 3A is above regulation schedule. Of the total weekly discharge to the ENP from WCA 3A, the desired distribution between WSRS and NESRS is 45 and 55 percent, respectively. If the G-3273 gage exceeds 6.8 feet, the maximum discharge from S-333 is limited to outflow through the S-334 structure. Discharges from S-334 enter the L-31N Canal and hence move southward through the L-31N canal. For the No Action Alternative, stages in NESRS are similar to 95BaseMod stages except slightly lower (0.1' foot) for about 30% of the time. Pages H-101 to H-104 of Appendix H provide hydrologic details of the effects of Alternative 1 on indicator region 11 located in NESRS.

WSRS. The structures that provide flow to the WSRS area are the S-12 structures (A, B, C, and D). The S-12 structures operate to satisfy three criteria: (1) to pass 45 percent of the computed Rainfall Plan deliveries to WSRS or up to 100 percent when the maximum stage in L-29 is exceeded or when the capacity to move water into the SDCS via S-334 is limited; (2) to pass regulatory flows out of WCA 3A; and (3) and to provide a water surface of 6.0 feet or less at NP-205 during the nesting period. In some years where the CSSS nesting season is terminated by localized rainfall, the gates may be opened before July 15. Under 95BaseMod conditions, there are eight predicted periods of less than the 60 day criterion at NP205; under RPA 130 and ISOP9dR there are five predicted violations. In wet spring seasons, when localized heavy rainfall occurs (e.g. April 2000), it is difficult to meet this target. Closing the S-12 structures all year still produced five predicted violations. Both stages and stage duration were reduced to enhance the nesting season criteria.

WCA 1. WCA 1 would be similar to the 95BaseMod condition in the No Action Alternative. Wet and dry season hydrologic characteristics would not change to any great degree. Pages H-73 through H-76 of Appendix H provide hydrologic details for indicator region 26 located in WCA 1.

WCA 2A and WCA 2B. Both WCA 2A and WCA 2B would be similar to the 95BaseMod condition in the No Action Alternative. Wet and dry season hydrologic characteristics would

not change to any great degree. Pages H-77 to H-84 of Appendix H provide hydrologic details of the effects of Alternative 1 on WCA 2A and WCA 2B.

WCA 3A and WCA 3B. The WCA 3A area is a large area and can be relatively dry in the northern portion during a dry year. In a wet year, more than 90 percent of the area is inundated 100 percent of the time. WCA 3B is a smaller area but follows a similar pattern. In both areas, the stages of the No Action Alternative would be similar to the 95BaseMod conditions for much of the time. However, in WCA 3A, there is a slight reduction (about 28 weeks) of depths above 2.5 feet. Pages H-85 to H-96 of Appendix H provide hydrologic details of the effects of Alternative 1 on WCA 3A and WCA 3B.

Taylor Slough. There are numerous structures along L-31N, L-31W, and C-111 that are operated to maintain canal levels and discharge flow into the Rocky Glades and Taylor Slough areas. Structures S-332B and S-332D have been added to induce flows across the northern and eastern front of the Taylor Slough area. Under the No Action Alternative, the hydrology for Taylor Slough is similar to natural system conditions with the exception of slightly lower stages during dry periods. There are 7 fewer weeks of dry down in the No Action Alternative as compared to the 95BaseMod. Pages H-97 to H-100 of Appendix H provide hydrologic details of the effects of Alternative 1 on Taylor Slough.

Lower East Coast Area. There are concerns from an agricultural view that high water levels in the eastern canals (L-31N, L-31W, and C-111) would induce water levels in the coastal agricultural areas that would encroach on the two-foot zone criteria and thus damage crops. There is also residential concern that high water level in the canals and slower drainage would produce longer durations of water levels above ground surface. Analysis of the 31-year simulation runs for specific monitoring cells identified one cell (R22C29) where the peak stage increased 0.13 foot and one cell (R10C25) where the percent of time water levels would encroach on the two-foot root zone increased by about 10 percent. The remaining 8 cells experienced water levels at or below the root zone 70 to 100 percent of the time for all alternatives.

8.5 SMA. For the No Action Alternative, the water surface elevation in the eastern portion of this area is above ground level about one percent of the year for the 31-year simulation period based on the Rocky Glades Marl Gage G-596. The 95BaseMod condition simulation indicated about the same condition.

Biscayne Bay. Simulated mean annual surface flows discharged into Biscayne Bay for the 1965 – 1995 simulation period were the same except for South Bay where the No Action Alternative was about 23,000 acre-feet/year more than 95BaseMod wet season conditions and was about 40,000 acre-feet/year more in the dry season. Pages H-146 and H-150 of Appendix H provide hydrologic details of the effects of Alternative 1 on Biscayne Bay.

Florida Bay. The simulated annual average flows toward Florida Bay as indicated at T23 (R6C17-28) is about the same for the 1995BaseMod conditions and the No Action Alternative while the RPA102 flows were about 5 to 10% lower during June, July, and August. There is about a 20 percent reduction in flow volumes in SRS to Whitewater Bay during the month of

July. Pages H-147 and H-151 of Appendix H provide hydrologic details of the effects of Alternative 1 on Florida Bay.

Alternative 2.

NESRS. The effect of Phase 1 of this alternative (IOP 2b) to the hydrology (water levels in the NESRS) is similar to the 95BaseMod and essentially the same as the No Action Alternative.

Phase 2 for Alternative 2 is IOP2. This plan removes the G-3273 trigger, which under the other alternatives either closes S-333 or routes the discharge (flood discharges) through S-334. With the trigger gone, discharges to NESRS from S-333 via L-29 and the Tamiami Trail culverts can be made when G-3273 is above 6.8 feet. For this alternative, hydrology for the area changes because the discharges through S-333 increase in some years. Annual average ponding depth increased by 0.5 feet during the wettest 15 percent of the time. Removing the trigger on S-333 would provide approximately 115,000 acre-feet/year more water to NESRS. The hydroperiod, as well as the mid-to-lower flow ranges, shows no significant change. CSSS subpopulation E shows a significant increase in the discontinuous hydroperiod in wet years but without an adverse impact to the nesting season consecutive dry days. CSSS subpopulation B shows no significant change. CSSS subpopulation F shows a dramatic increase in the discontinuous hydroperiod in wet years, but has an adverse impact to the consecutive dry days during the nesting season.

WSRS. The effect of Phase 1 of this alternative to the hydrology (water levels in the WSRS) is essentially the same as the No Action Alternative. However, the 6.0 feet criteria at NP-205 would be exceeded six times as opposed to five times for the No Action Alternative.

Phase 2 of this alternative does not change how the S-12s are operated but there is a reduction in the annual volume of flow because more flow is passed down the NESRS side from S-333 via L-29 and the Tamiami Trail culverts (trigger removed). The reduction is about 53,000-acre feet (339,000 vs. 286,000 acre-feet). The 6.0 feet criteria at NP-205 would still be violated six times as opposed to five for the No Action Alternative.

WCA 1. WCA 1 would not be impacted by Alternative 2. Wet and dry season hydrologic characteristics would not change to any great degree.

WCA 2A and 2B. There is a change in the operation of these areas, as compared to the No Action Alternative and 95BaseMod, which results in higher stages in WCA 2A and WCA 2B. This can be characterized by an increase in stage of about 0.4 to 1.3 feet and having about 63 more weeks of depths greater than 2.5 feet in WCA 2A. An increase in stage of about 0.2 to 0.8 feet and having an increase of more than 450 weeks over the three year period of depths greater than 2.5 feet occurs in WCA 2B.

WCA 3A and 3B. There is an increase in the number of depths greater than 2.5 feet (13 weeks) in the high stage criteria these areas for Phase 1 of Alternative 2 as compared to the No Action Alternative and 95BaseMod. For Phase 2 of this alternative, operation of S-333

changes with removal of the G-3273 gage trigger; subsequently, there is a slight reduction (4 weeks) in the number of depths greater than 2.5 feet.

Taylor Slough. The effect of Alternative 2 (both phase 1 and 2) on the hydrology of Taylor Slough is much the same as the No Action Alternative and the 95BaseMod.

Lower East Coast Area. The effect of Phase 1 and Phase 2 of Alternative 2 to the hydrology is essentially the same as the 95BaseMod. However, in one cell (R20C28) there was an increase of about 0.75 foot in the stage at the highest 10^{th} percentile in phase 1.

8.5 SMA. The effect of Phase 1 of Alternative 2 on the hydrology (water levels in 8.5 SMA) is the same as the No Action Alternative and 95BaseMod. Phase 2 of Alternative 2 removes the trigger that would limit the operation of S-333 and allows greater discharges to the NESRS. With the 8.5 SMA project completion, the higher water levels in NESRS would not impact the 8.5 SMA. However, without the project, the duration of flooding would increase from about 1 to about 10 percent of time.

Biscayne Bay. The effect of Alternative 2, Phase 1, on Biscayne Bay would be to increase the wet seasons flows by about 20,000 acre-feet/year and the dry seasons flows by about 29,000 acre-feet. The effect of Alternative 2, Phase 2, on Biscayne Bay would be to increase the wet seasons flows by about 24,000 acre-feet/year and the dry seasons flows by about 6,000 acre-feet/year.

Florida Bay. The effect on Florida Bay of Alternative 2, Phase 1 is to reduce flows only slightly during June and July, but Phase 2 of Alternative 2 would be reduce to the flows by about 10 to 15 percent during the months of June, July and August.

Alternative 3.

NESRS. The effect of Phase 1 of this alternative (IOP 2a) to the water levels in the NESRS is similar to the 95BaseMod and essentially the same as the No Action Alternative.

Phase 2 for Alternative 2 is IOP2. This plan removes the G-3273 trigger, which under the other alternatives either closes S-333 or routes the discharge (flood discharges) through S-334. With the trigger gone, discharges to NESRS from S-333 via L-29 and the Tamiami Trail culverts can be made when G-3273 is above 6.8 feet. For this alternative, hydrology for the area changes because the discharges through S-333 increase in some years. Annual average ponding depth increased by 0.5 feet during the wettest 15 percent of the time. Removing the trigger on S-333 would provide approximately107,000 acre-feet/year more water to NESRS. The hydroperiod, as well as the mid-to-lower flow ranges, shows no significant change. CSSS subpopulation E shows a significant increase in the discontinuous hydroperiod in wet years but without an adverse impact to the nesting season consecutive dry days. CSSS subpopulation B shows no significant change. CSSS subpopulation F shows a dramatic increase in the discontinuous hydroperiod in wet years, but has an adverse impact to the consecutive dry days during the nesting season.

WSRS. Phase 1 of this alternative discharges about 26 percent more flow into the area than Phase 2. Phase 2 of this alternative removes the trigger stage on S-333 and that causes an increase of flows into NESRS and a decrease of flows into the WSRS. However, the 6.0 feet criteria at NP-205 would be violated six times as opposed to five for the No Action Alternative.

WCA 1. WCA 1 would not be impacted by Alternative 3. Wet and dry season hydrologic characteristics would not change to any great degree.

WCA 2A and WCA 2B. There is a change in the operation of these areas, as compared to the No Action Alternative and 95BaseMod, which results in higher stages in WCA 2A and WCA 2B. This can be characterized by an increase in stage of about 0.4 to 1.3 feet and having about 63 more weeks of depths greater than 2.5 feet in WCA 2A. An increase in stage of about 0.2 to 0.8 feet and having an increase of more than 450 weeks over the three year period of depths greater than 2.5 feet in WCA 2B.

WCA 3A and WCA 3B. There is an increase in the number of depths greater than 2.5 feet (46 weeks) in the high stage criteria in WCA 3A for Phase 1 of Alternative 2 as compared to the No Action Alternative and 95BaseMod. For Phase 2 of this alternative, operation of S-333 changes with removal of the G-3273 gage trigger; subsequently, there is a small reduction (27 weeks) in the number of depths greater than 2.5 feet.

Taylor Slough. The effect of Alternative 3 (both Phase 1 and Phase 2) on the hydrology in the Taylor Slough area is minimal and similar to the No Action Alternative and the 95BaseMod conditions.

East Coast Agricultural Area. The effect of this alternative, Phase 1 and Phase 2, on the hydrology of the subject area is negligible. However, in two cells (R20C28 and C16R29) there were increases of about 0.7 foot in the stage at the highest 10^{th} percentile in phase 1.

8.5 SMA. The effect of Phase 1 of Alternative 3 on the hydrology (water levels in 8.5 SMA) is the same as the No Action Alternative and 95BaseMod. Phase 2 of Alternative 3 removes the trigger that would limit the operation of S-333 and allows greater discharges to the NESRS. With the 8.5 SMA project completion, the higher water levels in NESRS would not impact the 8.5 SMA. However, without the project, the duration of flooding would increase from about 1 to about 10 percent of time.

Biscayne Bay. The effect of Alternative 3, Phase 1, on Biscayne Bay would be the to increase the wet seasons flows by about 13,000 acre-feet/year and the dry seasons flows would be about the same. The effect of Alternative 3, Phase 2, on Biscayne Bay would be the to increase the wet seasons flows by about 24,000 acre-feet/year and the dry seasons flows by about 6,000 acre-feet/year.

Florida Bay. The effect on Florida Bay of Alternative 3, Phase 1 (like RPA102) is to reduce flows during June, July, and August by about 10 to 20 percent; Phase 2 of Alternative 3 would be reduce the flows by about 10 to 15 percent during the months of June, July and August.

Alternative 4.

NESRS. The effect of Phase 1 of this alternative (IOP 3a) to the water levels in the NESRS is similar to the 95BaseMod and essentially the same as the No Action Alternative.

Phase 2 for Alternative 4 is IOP3. This plan removes the G-3273 trigger and discharges to NESRS from S-333 via L-29 and the Tamiami Trail culverts. For this alternative, hydrology for the area changes because the discharges through S-333 increase in some years. Annual average ponding depth increased by 0.5 feet during the wettest 15 percent of the time. Removing the trigger on S-333 would provide approximately 109,000 acre-feet/year more water to NESRS. The hydroperiod, as well as the mid-to-lower flow ranges, shows no significant change. CSSS subpopulation E shows a significant increase in the discontinuous hydroperiod in wet years but without an adverse impact to the nesting season consecutive dry days. CSSS subpopulation B shows no significant change. CSSS subpopulation F shows a dramatic increase in the discontinuous hydroperiod in wet years, but has a significant adverse impact to the consecutive dry days during the nesting season.

WSRS. Phase 1 of this alternative, the overall flow to the area is slightly reduced because of the early S-12 closures. In Phase 2, this impact is increased – the stage duration is decreased from 73 to 67%, the wet season stages are reduced by about 0.25 feet, and dry downs (stages < -1 foot) are increased from 172 to 195 events. With the earlier closing of the S-12s, the dry season flows are reduced to 10% of all other alternatives.

The number of predicted failures at NP-205 is five – the same as the No Action Alternatives. Unlike the No Action Alternative, the S-343 (A&B), S-344, and all S-12s would be closed from November 1 until July 15. Also unlike the No Action Alternatives, the complete closure of the WCA 3A outlets into WSRS would have significant impacts within WCA 3A (addressed below).

WCA 1. WCA 1 would be impacted by Alternative 4. An increase of 0.2 foot in the regulatory schedule resulted in depths greater than 2.5 feet (by 51 weeks) of the performance measure criteria.

WCA 2A and WCA 2B. There is a change in the operation of these areas, as compared to the No Action Alternative and 95BaseMod, which results in higher stages in WCA 2A and WCA 2B. This can be characterized by an increase in stage of about 0.4 to 1.3 feet and having about 63 more weeks of depths greater than 2.5 feet in WCA 2A. An increase in stage of about 0.2 to 0.8 feet and having an increase of more than 450 weeks of depths greater than 2.5 feet in WCA 2B.

WCA 3A and WCA 3B. The combination of earlier closure of the S-12s and not passing water to L-31N dramatically increases the stages in the south and the south central areas of WCA 3A. For Phase 1, the depths greater than 2.5 feet increase by about 90 weeks for the south region (only RPA102 was worse) and by 72 in the south central region (the No Action Alternative and the 95BaseMod). For Phase 2, the depths greater than 2.5 feet increase by

about 24 weeks for the south region and by about 37 weeks in the south central region (over the No Action Alternative and the 95BaseMod). Most of the highest stage increases (0.5 to 1.0 foot) occurs in wet years like 1995. For WCA 3B, the stage increases were not significant, however the depths greater than 2.5 feet increased from 2 to 6 weeks for both Phase 1 and 2 (over the No Action Alternative and the 95BaseMod).

Taylor Slough. The effect of Alternative 4 (both Phase 1 and Phase 2) on the hydrology in the Taylor Slough area is minimal and similar to the No Action Alternative and the 95BaseMod conditions.

East Coast Agricultural Area. Alternative 4 shows no significant pattern changes to the stages in the subject area.

8.5 SMA. The effect of Phase 1 of Alternative 4 on the hydrology (water levels in 8.5 SMA) is the same as the No Action Alternative and 95BaseMod. Phase 2 of Alternative 4 removes the trigger that would limit the operation of S-333 and allows greater discharges to the NESRS. With the 8.5 SMA project completion, the higher water levels in NESRS would not impact the 8.5 SMA. However, without the project, the duration of flooding would increase from about 1 to about 10 percent of time.

Biscayne Bay. The effect of Alternative 4, Phase 1, on Biscayne Bay would be the to increase the wet seasons flows by about 14,000 acre-feet/year and the dry seasons flows would be about the same. The effect of Alternative 4, Phase 2, on Biscayne Bay would be the to increase the wet seasons flows by about 26,000 acre-feet/year and the dry seasons flows by about 9,000 acre-feet/year.

Florida Bay. The effect on Florida Bay of Alternative 4, Phase 1 is to reduce flows during June, July, and August by about 10 to 25 percent; Phase 2 of Alternative 4 would be to reduce the flows by about 10 to 15 percent during the months of June, July and August. With the earlier closures of the S-12s and not passing S-333 releases to L-31N, the Phase 1 flows to Florida Bay are significantly less in several months when compared to Alternative 1. Phase 2 flows to Florida Bay are slightly more than Alternative 1 during October and November, but slightly less than Alternative 1 in June and July. The Phase 1 and 2 flows to Whitewater Bay, via Shark River Slough, are less than Alternative 1 during November through February. These areas have already been subject to reduced flows due to the implementation of ISOP; closing on November 1 would further increase the adverse impact on salinity.

Alternative 5 (Preferred Alternative).

NESRS. Alternative 5, Phase 1, is similar to the No Action Alternative with regard to impacts on NESRS except there is about a 0.1 foot decrease in stages for about 30 percent of the time. One of the primary difference between this alternative and Alternatives 2, 3, and 4 was allowing S-12D to remain open all year. In Phase 2 (as in the other alternatives), the constraint at G-3273 is removed. Annual average ponding depth increased by 0.5 feet during the wettest 15 percent of the time. Removing the trigger on S-333 would provide

approximately 103,000 acre-feet/year more water to NESRS. The hydroperiod, as well as the mid-to-lower flow ranges, shows no significant change.

Unlike the No Action Alternative, Alternative 5 also changes the pump criteria in L-31N to improve the hydrologic characteristics for the eastern sparrow regions. This is most noticeable in CSSS subpopulation F which shows a dramatic increase in the discontinuous hydroperiod in wet years, but has a less of an adverse impact to the consecutive dry days during the nesting season than in Alternatives 2,3, and 4. CSSS subpopulation E shows a significant increase in the discontinuous hydroperiod in wet years without an adverse impact to the nesting season consecutive dry days. CSSS subpopulation B shows no significant change.

WSRS. Alternative 5 would be similar to the No Action alternative with regard to impacts to WSRS. The proposed closing schedule for the S-12 structures is the same for Alternative 5 as with the No Action Alternative. The number of predicted failures in the 31year period of record at NP205 is the same (five) as with Alternative 1 and RPA130.

WCA 1. WCA 1 would not be impacted by Alternative 5. Neither wet nor dry season hydrologic conditions would change from Alternative 1 or the 95BaseMod.

WCA 2A and WCA 2B. Alternative 5 does not significantly change the hydrologic characteristics of either WCA 2A or WCA 2B from Alternative 1 or the 95BaseMod.

WCA 3A and WCA 3B. The preliminary stage duration curves indicate that Alternative 5, Phase 2, slightly increase water levels (about 0.2 foot) with an increase in depths greater than 2.5 feet of 25 weeks out of the 1,612 weeks modeled in WCA 3A over the No Action Alternative and Phase 1. However, the total number of weeks is still less than or equal to the 95BaseMod condition. Similarly, a stage increase of about 0.3 feet (closer to NSM stages) without significant increase to depths greater than 2.5 feet occurred in WCA 3B. The final model runs are expected to show a decrease in water levels from the No Action Alternative and Phase 1.

Taylor Slough. The effect of Alternative 5 is essentially the same as with the No Action Alternative.

East Coast Agricultural Area. Alternative 5 shows no significant pattern changes to the stages in the subject area.

8.5 SMA. The effect of Alternative 5 is the same as with the No Action Alternative on this area.

Biscayne Bay. The effect of Alternative 5 is negligible when compared to the No Action Alternative.

Florida Bay. The effect of Alternative 5 is similar to the No Action Alternative on this area but has about 10 percent less flow during the months of June, July, and August.

Alternative 6.

Alternative 6 is essentially the same as Alternative 5 with the addition of a 240 acre seepage reservoir at S-332B to supplement the existing 160 acre reservoir. Hydrologic model runs are not yet available for this alternative, but might be posted on the previously referenced web site (www.saj.usace.army.mil) during the 45-day comment period.

NESRS. There are no proposed changes that would affect NESRS; Alternative 6 is expected be similar to the No Action alternative with regard to impacts on NESRS. In Phase 2 (as in the other alternatives), the constraint at G-3273 would be removed. However, changes will occur with regard to the amount of overflow potentially impacting the CSSS subpopulations E and F. The increase in size of the seepage reservoir will significantly reduce, if not eliminate, weir overflow from the water pumped from S-332B.

WSRS. There are no proposed changes that would affect WSRS; Alternative 6 is expected to be similar to the No Action Alternative with regard to impacts to WSRS. The proposed closing schedule for the S-12 structures is the same for Alternative 6. As with the No Action Alternative, this schedule would attempt to dry the area out by March 1, but five periods of less than 60 days below 6.0 feet at NP-205 are predicted.

WCA 1. There are no proposed changes to the operations of WCA 1; it is not expected be impacted by Alternative 6.

WCA 2A and WCA 2B. There are no proposed changes to the operations of WCA 2A or 2B; they are not expected be impacted by Alternative 6.

WCA 3A and WCA 3B. There are no proposed changes to the operations of WCA 3A or 3B; they are not expected be impacted by Alternative 6.

Taylor Slough. The effect of Alternative 6 is expected to be essentially the same as with Alternative 5.

East Coast Agricultural Area. Alternative 6 should show no significant pattern changes to the stages in the subject area.

8.5 SMA. The effect of Alternative 6 would be the same as Alternative 5 in this area.

Biscayne Bay. The effect of Alternative 6 would be negligible when compared to Alternative 5.

Florida Bay. The effect of Alternative 6 is the same as with Alternative 5 in this area.

4.4 Water Supply

There would be no significant impact on water supply with any of the project alternatives. The proposed water releases from all six alternatives would not reduce storage capability or aquifer recharge in the project area.

4.5 Water Quality

None of the alternatives are expected to cause water quality problems in the WCAs or Shark River Slough. There would be a potential impact to water quality in the vicinity of S-332B. The station is currently (No Action alternative) designed to pump 325 cfs from June through January, and 125 cfs from February through March to maintain head water levels between either 4.7 and 4.2 into a 160 acre seepage reservoir. If flows greater than 120 to 300 cfs (depending on the surrounding water levels) are pumped from the S-332B structure, the water would eventually flow over the weir of the seepage reservoir and enter the ENP as overland flow. It is not believed at this time that a violation of the settlement agreement levels would occur due to the overflows. This is based on the limited overflow data (September and October 2000 events). The settlement agreements for Taylor Slough are based on a flow weighted average for all inflow points into the Taylor Slough region.

Alternatives 2, 3, and 4 would pump 325 cfs year round to maintain water levels between 4.5 and 4.0. The alternatives have the option of increasing the pumping up to 500 cfs during the wet season to lower pressure on retaining excess water in the WCAs. Impacts to water quality would be similar to those of the No Action alternative.

Alternative 5, the preferred alternative, would increase pumping to 500 cfs from July 16 to November 30, which would result in an overflow of the S-332B retention basin in excess of those from Alternatives 1, 2, 3, and 4. Even though Alternative 5 would have greater overflow than the other alternatives, it is not believed that this would result in a violation of the settlement agreement levels.

Alternative 6 would also increase pumping to 500 cfs from July 16 to November 30. Alternative 6 would attenuate water quality impacts from the increased pumping and subsequent overflow by adding an additional 240 acre seepage reservoir to work in conjunction with the existing 160 acre reservoir. The additional seepage reservoir would help reduce weir inflows and provide additional treatment area.

4.6 Flood Control

L-31N is on the east side of the 8.5 SMA and the ENP is to the north and west. For the No Action Alternative the water surface elevation in the eastern portion of this area the water level is above ground level about one percent of the year for the 31-year simulation period based on the Rocky Glades Marl Gage G-596. The 95BaseMod condition simulation indicated about the same condition. The effect of Phase 1 of Alternative 1 to the hydrology (water levels in 8.5 SMA) is the same as the No Action Alternative. The effects of Phase 2 of

Alternatives 2, 3, and 4 are also expected to have no adverse impact on flooding in the area after the 8.5 SMA Project is constructed. Without the mitigation feature, surface flooding (as indicated by G-596) would increase from 1 to 10 percent of time. Groundwater levels would be increased over a somewhat longer period.

To the east of L-31N and C-111, the peak stage indicators in several cells show that the 95BaseMod condition and all of the alternatives were nearly equivalent with no pattern of being worse or better. Only cell R10C25 indicated a longer duration of root zone flooding (from 48% to 56% of time); however, neither the peak stage nor the stage at the highest 10^{th} percentile were worsened.

4.7 Wetlands

The six alternatives would have similar types of impacts on wetlands. In general, wetlands in NESRS, the Rocky Glades, and the western marl prairies are expected to benefit from the restoration of more natural hydroperiods, whereas increased flooding in southern WCA 3B and WCA 2A may contribute to negative wetland impacts. Wetland impacts associated with each of the project alternatives are essentially the same as vegetative community impacts that are discussed in more detail in the following section.

4.8 Vegetation

NESRS

The No Action alternative and Phase 1 operations of the various alternatives are likely to have similar effects on water levels and vegetation in NESRS. All of these operational plans either close the S-333 structure or reroute discharges through the S-334 structure when water levels at G-3273 exceed 6.8 feet. Therefore, any changes in NESRS hydroperiods and resulting shifts in vegetative communities would be similar under each of these alternatives. Each of these operational plans also would produce hydrological conditions very similar to 95BaseMod conditions, with similar effects on vegetative communities. Removal of the G-3273 trigger under Phase 2 of Alternatives 2, 3, 4, 5, and 6 allows discharges via S-333 when water levels exceed 6.8 feet at G-3273. Discharges to NESRS through S-333 would increase when water levels at G-3273 surpass 6.8 feet.

Increases in ponding depths and hydroperiod duration associated with Phase 2 of the various alternatives should benefit vegetative communities in NESRS and the northeastern marl prairies by restoring longer and more natural hydrologic regimes to the area. Over-drainage in the peripheral wetlands along the eastern flank of NESRS has resulted in shifts in community composition, invasion by exotic woody species, and increased susceptibility to fire (USFWS 1999a,b). Increases in ponding depths and hydroperiod duration associated with Phase 2 operations should help to reverse these trends by reducing tree island susceptibility to fire, restoring deeper water habitats required for slough/open water marsh communities, and reducing the amount of available habitat for less flood tolerant exotic tree species.

WSRS and Western Marl Prairies

The WSRS area is primarily influenced by S-12 structure operations, which are the same for Alternatives 2 and 3. Consequently, any changes in WSRS hydroperiods and resulting shifts in vegetative communities would be similar under each of the alternatives. Each of the alternatives would result in a similar reduction of annual flooding duration in WSRS and the western marl prairies relative to 1995 Base conditions. Alternative 4, which would close the S-12 structures at an earlier date (November 1) than these alternatives, would reduce the flooding duration even more in this section. All of the alternatives should have a similar beneficial effect on the western short-hydroperiod marl prairies by producing shorter hydroperiods that would benefit marl prairie vegetation. Alternatives 1, 5, and 6 have similar operational components of the S-12 structures. The operations are an intermediate closing schedule between the Alternative 2 and 3 closings and the Alternative 4 closing. The westernmost S-12 structures (A, B, and C) would be closed November 1, January 1, and February 1, respectively. S-12D, which has the least impact of the western sparrow habitats, would remain open year round to allow excess water to leave the WCA areas. Alternatives 1, 5, and 6 would benefit vegetation in WSRS in much the same manner as the other alternatives.

Water Conservation Area 2

Alternatives 2 and 3 would produce very similar hydrological conditions in WCA 2. Average annual flooding duration and ponding depths are not significantly different for the two alternatives. These alternatives reduce flooding impacts to WCA 3A by holding back water in WCA 2A. In comparison to 95BaseMod conditions, Alternatives 2 and 3 produce substantial increases in the frequency and depth of high water events in WCA 2A. Past increases in flooding in WCA 2A have resulted in the drowning of tree islands, loss of long-hydroperiod wet prairie communities, and loss of sawgrass marshes along sloughs (USACE 1999a). Increases in flooding associated with the alternatives are likely to have an adverse impact on tree islands and other wetland communities in WCA 2A. Adverse affects may include loss of remnant tree islands, conversion of short hydroperiod wetlands to low-diversity sawgrass-cattail marshes, and conversion of long hydroperiod marshes to open water slough. Alternative 4 would have an even greater adverse impact on WCA 2.

Alternative 4 actions include closing the S-12 and S-343/344 structures from November 1 to July 15, which would cause additional water retention in WCA 2A and would lead to loss of more tree islands, wet prairie communities, and other habitat.

Alternatives 5 and 6 (as well as the No Action alternative), close one of the S-12 structures (S-12A) earlier than Alternatives 2 and 3, the same with S-12B and S-12C, and do not close S-12D. The result of this would be less adverse impact from ponding on WCA 2A.

In comparison to 1995 Base conditions, all of the alternatives produce substantial increases in the duration of high stage events in WCA 2B. WCA 2B has suffered from lowered water levels that resulted in heavy melaleuca infestations throughout the area (USACE 1999a). Increases in the duration of high stage events in WCA 2B is expected to benefit vegetative communities by slowing the advance of melaleuca. However, if the duration of inundation were too high, adverse impacts could occur to vegetation and tree islands in the area.

Water Conservation Area 3

Alternative 2-Phase 2 (IOP 2) and Alternative 3-Phases 1 (IOP 2A) and 2 (IOP 2) would result in a very small increase in hydroperiod duration from the 300 to 330 day range to the 330 to 365 day range for one cell in WCA 3A and one cell in WCA 3B, relative to Alternative 2-Phase 1 (IOP 2B). These same operations would also increase average annual ponding depth classes from the 0.5 to 1.0 feet range to the 1.0 to 2.0 feet range in a few cells in the central and eastern portions of WCA 3A and over a large portion of the lower two-thirds of WCA 3B. Compared to 1995 Base conditions, Alternative 2-Phase 2 and Alternative 3-Phases 1 and 2 would produce similar conditions in WCA 3A and greater average ponding depths in 3B. Conversely, Alternative 2-Phase 1 would produce conditions similar to 95BaseMod in WCA 3B and slightly dryer conditions in northeastern WCA 3A. Alternative 4 would have an adverse impact on WCA 3A. Higher water levels caused by the early closure of the S-12 structures could impact vegetation on the southern portion of the WCA. For example, if the S-12s had been closed on November 1 in 1999, the water elevations would have been almost two feet higher than were realized. This could have had a detrimental effect on vegetation. Alternative 1 (No Action alternative), Alternative 5, and Alternative 6 would provide hydrologic relief to NESRS and WSRS without the excessive ponding in WCA 3A of Alternative 4. S-12D would remain open and provide an important conduit for excess rainfall inundating WCA 3A during wet years without causing higher water elevations in the western sparrow habitat.

Currently, the two most significant causes of habitat degradation in WCA 3A are flood damage to tree islands in the northeastern and southwestern portions of 3A and the loss of peat soils, marshes, and tree islands in the northern portions of WCA 3A as a result of drought conditions and resulting wildfires. Although WCA 3B is drier than pre-drainage conditions, tree islands have remained largely unimpacted in this area. Alternatives 1, 2, 3, 5, and 6 would not have a significant effect on vegetation throughout the majority of WCA 3A, with the exception of slightly drier conditions in extreme northeastern 3A under Alternative 1 and Alternative 2-Phase 1. These drier conditions may provide some relief for tree islands that have experienced flood damage in this area. The increases in ponding depths in WCA 3B under Alternatives 1, 2, 3, 5, and 6 may provide some relief for over drained areas in southeastern 3B. Increases in ponding depths in the remainder of 3B under these same alternatives may have negative effects on some tree islands as a result of increased flooding. Alternative 4 would also increase ponding depths in WCA 3B, but to a greater degree than the other alternatives.

Eastern Marl Prairies and Taylor Slough

Although Alternative 2, Phase 1 (IOP 2A) removes a berm in front of L-31W for the purpose of encouraging sheet flow to the eastern marl prairies, the average annual hydroperiod distribution for Taylor Slough and the eastern marl prairies is similar to Alternative 1. Alternative 1 and Alternative 2-Phase 1 both produce a similar increase in hydroperiod duration in the eastern Rocky Glades, relative to 95BaseMod conditions. Alternative 3-Phase 1 (IOP 2B) would increase the annual hydroperiod distribution for cells in the northeastern Rocky Glades, relative to Alternative 1 and Alternative 2-Phase 1. Phase 2 (IOP 2) of Alternatives 2 and 3 and Alternative 4 would produce hydroperiod increases similar to

Alternative 3-Phase 1 in the northeastern Rocky Glades, but would also increase hydroperiods closer to the central, eastern Rocky Glades. None of the alternatives produce measurable changes in the central and lower portions of Taylor Slough. The effects of the alternatives on ponding depths follow a similar pattern to the hydroperiod distribution effects. Increases in hydroperiods in the eastern Rocky Glades areas adjacent to the LEC urban areas should benefit vegetative communities that have suffered from over drainage in the past. Marl prairies in the northern Rocky Glades adjacent to the LEC urban areas have been negatively affected by over drainage that resulted in invasion by woody shrubs and increases in fire frequency.

Alternatives 5 and 6 would impact vegetation in the eastern marl prairie and Taylor Slough similar to the other alternatives, but higher flows from S-332B should increase the beneficial hydrologic impacts to the region. However, increased phosphorus levels with overflows associated with Alternative 5 could have an adverse effect on the vegetative community. These impacts would be much lower with Alternative 6 due to the water quality attenuation with the additional 240 acre seepage reservoir.

Florida Bay

Wet season flows dominate the average annual freshwater flow volumes for all of the alternatives and 95BaseMod conditions. There are no substantial differences between the alternatives in average annual or monthly freshwater flow volumes towards Florida Bay, and none of the alternatives would substantially increase or decrease freshwater flows towards Florida Bay relative to 95BaseMod conditions. Consequently, none of the alternatives are expected to produce substantial changes in the Florida Bay salinity regime or significant impacts to mangrove or seagrass communities.

4.9 Fish and Wildlife

All of the alternatives (including the No Action alternative) increase hydroperiod duration and ponding depths in NESRS and are expected to benefit aquatic organisms. Populations of marsh fishes are expected to increase with increased hydroperiod duration and an increase in available habitat. Longer maintenance of dry season refugia is expected to increase survival over the dry season. Wading bird populations are expected to benefit from enhancement and expansion of foraging habitat and increases in the aquatic prey base. Increased hydroperiods and the associated reduction in fire frequency is expected to benefit tree island nesting habitat. Similarly, alligators are expected to benefit from the expansion and enhancement of habitat and increases in the prey base. Increases in hydroperiods are also expected to increase alligator abundance, nesting efforts, and nesting success.

Currently, the Rocky Glades/Eastern Marl Prairies are among the most degraded aquatic habitat within the southern Everglades (USACE 1999a). All of the alternatives provide some benefit for the northern Rocky Glades and northern Taylor Slough by increasing hydroperiod duration and ponding depths. Compared to 95BaseMod conditions, Alternative 2-Phase 1 has the least influence on hydroperiod duration followed by Alternative 3-Phase 1, which increases the annual hydroperiod duration for cells in the northeastern Rocky Glades. Phase 2 of Alternatives 2 and 3 would produce hydroperiod increases similar to Alternative 3-Phase 1

in the northeastern Rocky Glades, but would also increase hydroperiods closer to the central, eastern Rocky Glades. None of the alternatives produce measurable changes in the central and lower portions of Taylor Slough. In general, increases in hydroperiod duration and ponding depths are expected to benefit fish and wildlife habitat by restoring more natural hydroperiods and reducing woody plant invasion and fire frequency in the northern Rocky Glades. Expansion of aquatic habitat and longer maintenance of dry season solution hole refugia are expected to increase the aquatic prey base and improve foraging habitat for wading birds. Increases in hydroperiods are also expected to increase alligator abundance, nesting efforts, and nesting success.

In comparison to 1995 Base conditions, all of the alternatives produce substantial increases in the frequency and depth of high water events in WCA 2A. WCA 3B would experience increases in average ponding depths across the lower two-thirds of the area under Phase 2 of Alternative 2, both phases of Alternative 3 and Alternative 4. Alternative 1 and Phase 1 of Alternative 2 do not increase ponding depths in WCA 3B compared to 95BaseMod conditions. Increases in average ponding depths in WCA 2A and southern WCA 3B, especially with Alternative 4, may decrease prey availability by reducing the concentration of prey during the dry season. Decreases in prey availability during the nesting season have the potential to adversely affect wading bird populations by reducing nesting success.

Alternatives 5 and 6 would provide benefit to the northern Rocky Glades and northern Taylor Slough (similar to the other alternatives) without substantially adversely affecting habitats located in WCA 2A or WCA 3B because of the continuous pumping of S-12D.

4.10 Protected Species

In accordance with the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 1531 *et seq.*) and Section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*), the Department of the Interior has prepared a Planning Aid Letter (Appendix F) for the IOP alternatives. The Department of the Interior is currently preparing a Fish and Wildlife Coordination Act Report (Appendix E), which will be incorporated into the Final EIS.

CSSS

Reasonable and Prudent Alternatives

The USFWS BO presents the USFWS RPA to the Experimental Program that would avoid jeopardizing the CSSS. The USFWS RPA recommends that the selected IOP produce the following hydrological conditions for protection of the CSSS: 1) A minimum of 60 consecutive days of water levels at or below 6.0 feet NGVD at NP 205 between March 1 and July 15; 2) Ensure that 30%, 45%, and 60% of required regulatory releases crossing the Tamiami Trail enter ENP east of L-67 extension in 2000, 2001, and 2002; respectively (or produce hydroperiods and water levels in the vicinity of CSSS subpopulations C, E, and F that meet or exceed those produced by the 30%, 45%, and 60% targets); and 3) Produce hydroperiods and water levels in the vicinity of CSSS subpopulations C, E, and F that equal

or exceed conditions that would be produced by Test 7, Phase 2 operations. Alternatives 1, 2, 3, 5, and 6 meet or exceed 60 consecutive days of water levels at or below 6.0 feet NGVD at NP 205 in 25 of the 31 years (81 percent of the years) comprising the simulation period, while Alternative 4 meets the recommendation in 26 of the 31 years (84 percent of the years). All of the alternatives meet or exceed the 30%, 45%, and 60% targets and meet or exceed conditions that would be produced by Test 7, Phase 2 operations.

Subpopulation A - Cape Sable Seaside Sparrow

All of the project alternatives produce approximately the same number of consecutive days of water levels at or below 6.0 feet NGVD at NP 205 between March 1 and July 15. As stated above, all alternatives meet or exceed this target in 25 of the 31 years (except Alternative 4, which meets or exceeds the criteria in 26 of the 31 years) comprising the simulation period. In comparison, 95BaseMod conditions meet or exceed this target in 23 of the 31 years that were simulated. Each of the alternatives would result in a similar reduction of annual flooding duration in the CSSS subpopulation A western marl prairie habitat relative to 95BaseMod conditions. Five of the alternatives (1, 2, 3, 5, and 6) should have a similar beneficial effect on the western sparrow habitat by producing shorter hydroperiods that would benefit short hydroperiod marl prairie vegetation in the vicinity of CSSS subpopulation A. Alternative 4 meets the USFWS RPA recommendations slightly better than the other alternatives for CSSS subpopulation A. However, the margin of error within components of the model input could affect the model output and predictions, resulting in different conclusions, the additional year that this alternative meets the USFWS RPA recommendation is suspect.

Subpopulations C, E, and F - Cape Sable Seaside Sparrow

All of the alternatives meet or exceed the USFWS RPA recommendation for production of the 30%, 45%, and 60% regulatory release conditions. All of the alternatives would produce larger increases in annual average ponding depths and hydroperiod duration in the vicinity of CSSS subpopulation E compared to 95BaseMod conditions. The alternatives are expected to provide the greatest beneficial effects for the eastern marl prairies by restoring longer, more natural hydrologic regimes to the area.

All of the alternatives meet or exceed the USFWS RPA recommendation for implementation of Test 7, Phase 2 conditions in the vicinity of CSSS subpopulations C, E, and F; and all of the alternatives provide some benefit for CSSS subpopulations C, E, and F by increasing hydroperiods in the Rocky Glades. Alternative 2-Phase 1 produces the smallest increase in Rocky Glades hydroperiods. Alternative 3-Phase 1 would increase the annual hydroperiod distribution for cells in the northeastern Rocky Glades compared to Alternative 1 and Alternative 2-Phase 1. Phase 2 of Alternatives 2 and 3 would produce hydroperiod increases in the northeastern Rocky Glades similar to Alternative 3-Phase 1; and would also increase hydroperiods closer to the central, eastern Rocky Glades. None of the alternatives produce measurable changes in the central and lower portions of Taylor Slough.

Subpopulation D - Cape Sable Seaside Sparrow

None of the alternatives produce changes in the average hydroperiods or ponding depths in the vicinity of CSSS subpopulation D compared to 1995 Base conditions. Consequently, none of the alternatives is expected to alter the status of CSSS subpopulation D.

Subpopulation B - Cape Sable Seaside Sparrow

None of the alternatives produce changes in the average hydroperiods or ponding depths in the vicinity of CSSS subpopulation B compared to 1995 Base conditions. Consequently, none of the alternatives is expected to alter the status of CSSS subpopulation B.

Snail Kite

Restoration of longer, more natural hydroperiods in Shark River Slough and peripheral wetlands is expected to improve snail kite habitat in the ENP by creating more favorable conditions for apple snails. Average annual flooding duration and ponding depths in WCA 2 are not significantly different for Alternatives 1, 5, and 6; however, Alternatives 2, 3, and 4 produce substantial increases in the frequency and depth of high water events in WCA 2A compared to 95BaseMod conditions. Increases in flooding may result in the loss of some small trees and the conversion of some long hydroperiod marshes to unvegetated open water habitat. Consequently, Alternatives 2, 3, and 4 may have a negative impact on snail kite foraging and nesting habitat in WCA 2A. Average annual flooding duration and ponding depths in WCA 3A are not significantly different for the alternatives. Consequently, none of the alternatives is expected to significantly alter the status of snail kites or their habitat in WCA 3A.

Wood Stork

The quality of foraging habitat in NESRS and the Rocky Glades is expected to improve as a result of increases in annual hydroperiod distribution. Increases in hydroperiods are expected to improve foraging habitat by expanding the available habitat for aquatic prey base species and prolonging the availability of dry season refugia for prey species. All of the alternatives are expected to provide the benefit for NESRS and Rocky Glades habitats by providing increases in ponding depths and hydroperiod distributions. None of the alternatives are expected to improve the reduced freshwater flows to the traditional mangrove nesting and foraging habitats of Florida Bay. Consequently, all alternatives may continue conditions that are likely to delay colony formation and decrease the probability of a successful nesting season in Florida Bay.

American Crocodile

None of the alternatives is expected to have a significant effect on the salinity of estuarine habitats preferred by the American crocodile. Consequently, the American crocodile is not likely to be adversely affected by any of the alternatives.

West Indian Manatee

None of the alternatives is expected to have a significant effect on the salinity of estuarine habitats preferred by the West Indian manatee. Consequently, the West Indian manatee is not likely to be adversely affected by any of the alternatives.

Bald Eagle

None of the alternatives is expected to have a significant effect on bald eagle nesting sites or foraging habitat. Consequently, the bald eagle is not likely to be adversely affected by any of the alternatives.

Florida Panther

The Florida panther occurs primarily in upland habitats. Hydrologic effects of the alternatives are expected to be limited to existing or historic wetlands and are not expected to have significant effects on the upland habitats preferred by these species. However, a component of Alternative 6 involves construction of a 240 acre seepage reservoir consisting of former agricultural lands lying immediately northeast of the existing West Water Detention Area (Figure 4). The site extends north from the vicinity of the S-332B discharge pipes to Hamlin Mill Road, and the eastern and southern boundaries are fenced with 3-strand barbed wire fencing. The land is largely in the early stages of old field succession with a margin of tall,

dense grasses and woody shrubs. Other than old truck-farm fields, the area includes two mango groves. An approximately 26 acre fenced grove in the east central portion of the area is relatively well manicured, with no ground or shrub layer and orderly rows of mature mango trees forming a closed canopy. An approximately 60 acre site in the northwest corner consists of smaller mango trees, more open canopy, and an overgrown, weedy shrub layer.

Fresh panther tracks were identified in November, 2000 along a dirt farm roadway in the northeast corner of the proposed site. The panther database revealed two records of panther located in the project area: both were of panther #16, which was originally collared in 1986, and died in early 2000. The habitats of possible panther utilization are the two mango grove areas, which could serve as primarily as movement corridors. The area in question is on the fringe of the panther habitat, and construction of the seepage reservoir would not likely significantly affect the panthers (S. Bass, personal communication with J. Moulding). However, any loss of panther habitat should be carefully considered and would be considered significant. The USFWS has expressed their support of the S-332B seepage reservoir due to the overriding benefits to the CSSS and reduction of water quality degradation provided by the seepage reservoir. Further coordination with the USFWS would be required prior to any action involving construction of this portion of Alternative 6.

Red-cockaded Woodpecker, Eastern Indigo Snake, and Garber's Spurge

The red-cockaded woodpecker, eastern indigo snake, and Garber's spurge occur primarily in upland habitats. Hydrologic effects of the alternatives are expected to be limited to existing

or historic wetlands and are not expected to have significant effects on the upland habitats preferred by these species. Consequently, no adverse effects to the red-cockaded

Proposed S-332B Seepage Basin	
Interim Operating Plan for Protection of the Cape Sable Seaside Sparrow	
Not to Scale	Drawn by:
Date: February 2001	Approved By:
	00-0377
	Figure 4

woodpecker, eastern indigo snake, and Garber's spurge are expected as a result of any of the alternatives.

4.11 Air Quality

There would be no significant impact to air quality with any of the project alternatives.

4.12 Noise

There would be no significant impact to noise levels with any of the project alternatives. The ambient noise levels with the current operations would experience only slight changes with implementation of any of the alternatives.

4.13 Aesthetics

There would be no significant impact to aesthetics with any of the project alternatives. Construction of new facilities would occur only with Alternative 6, and this would occur in an area that consists of former agricultural fields and mango groves. No alteration of the aesthetic characteristics of the region would occur with any of the other alternatives.

4.14 Recreation

There would be no significant impact to recreation with any of the project alternatives. Current recreational activities would not be disrupted due to any of the alternatives.

4.15 Land Use

There would be no significant impact to land use with any of the project alternatives. There are currently a number of parcels of privately owned, undeveloped land located within the ENP Expansion Area, which could experience higher water levels with the No Action Alternative as well as with all of the project alternatives, but acquisition of these parcels is being actively pursued by the National Park Service and should be complete in the near future.

4.16 Socioeconomics

There would be no additional impact to socioeconomics with any of the project alternatives.

4.17 Agriculture

To analyze agricultural conditions in the areas designated as LEC, which is the area to the east of the L-31N, L-31W, C-111 canal complex, a number of cells were identified and data

produced from the 31-year simulation runs for different operational scenarios (Appendix H). These cells are located in a north/south alignment just to the east of the canal complex.

From an agricultural viewpoint the most important parameter is root zone which is normally measured from ground surface to a depth of two feet. Thus the most revealing data from the simulation runs is percent of time the water surface is within the root zone. There are concerns from an agricultural view that high water levels in the eastern canals (L-31N, L-31W, and C-111) would induce water levels in the coastal agricultural areas that would encroach on the two foot root zone criteria and thus damage crops. Analysis of the 31-year simulation runs for specific monitoring cells along a north-south line in the lower east coast area 3 identified one cell where the percent of time water levels would encroach on the two foot root zone was near 50 percent, but the percent of time the water level reached or exceeded ground surface was less than 10 percent. The remaining eight cells experienced water levels at or below the root zone 70 to 100 percent of the time for all alternatives.

4.18 Hazardous, Toxic, and Radiological Materials

There would be no significant impact to HTRW sites with any of the project alternatives.

4.19 Cultural Resources

There would be no significant impacts to cultural resources from implementation of any of the alternatives. Current water level and inundation patterns would not be significantly altered with any of the alternatives that could affect known or unknown prehistoric or historic sites on tree islands or in solution holes.

4.20 Cumulative Impacts

The project area has been subject to federal involvement for many years. The need for flood control, water supply, recreation, and fish and wildlife enhancement has provided a difficult task of balancing various, and sometimes conflicting needs for the region. In the early years of the C&SF project, flood control was the overriding goal, and eventually the need for additional water supplies for south Florida required additional modification to the project. The Everglades National Park Protection and Expansion Act of 1989 directed the Corps:

"to construct modifications to the Central and South Florida Project to improve water deliveries into the park and shall, to the extent practicable, take steps to restore the natural hydrological conditions within the park."

Since that time, a number of federal actions have been authorized and implemented that have attempted to improve the flow of water to the ENP without compromising the other needs of the region (i.e., flood control, water supply). The cumulative effects of these actions have been mostly positive. However, some adverse effects have occurred. The 1999 Restudy Plan

(USACE 1999a) has already addressed cumulative effects of lost agricultural land use with the expansion of publicly owned lands in the region.

Cumulative impacts to the ENP in terms of hydrology, water quality, and natural resources has occurred with the many federal projects implemented over the years. However, this proposed action, along with other recent and future projects, should eventually restore the hydrology of the ENP to more natural conditions.

4.21 Unavoidable Adverse Impacts

Unavoidable adverse impacts could occur with all four alternatives. Impacts to water quality below pump station S-332B would occur with predicted overflow of levee of the seepage reservoir with all six alternatives. The detention of excess water in the WCAs could also occur with all six alternatives, and would likely continue in the future without full implementation of the MWD project.

4.22 The Relationship Between Local Short-Term Uses of Man's Environment and Maintenance of Long-Term Productivity

The proposed project was developed in response to the February 1999 USFWS Biological Opinion for the MWD project, Experimental Program, and C-111 Project. The proposed IOP is designed to avoid jeopardizing the CSSS, a federally-endangered species occurring within the ENP, during the interim period leading up to completion of the MWD project. The short-term uses of the environment with this project are greatly justified by the potential long-term benefit to this species.

4.23 Irreversible and Irretrievable Commitments of Resources

The proposed project would be in effect only until the full MWD Project is completed. The commitment of resources would be temporary in nature with this project, and the irreversible and irretrievable commitment of resources would be minimal. Loss of marginal Florida panther habitat would occur with implementation of Alternative 6 due to construction of the additional seepage reservoir.

4.24 Energy Requirements and Conservation Potential

Energy use of the preferred plan would be minimal and energy requirements for implementing any of the project alternatives would be similar. Conservation potential for any of the alternatives would be minimal.

4.25 Environmental Commitments

The Corps will continue to operate the water control structures as authorized and approved. The Corps will continue to consult with the USFWS, ENP, SFWMD, FFWCC, and other federal, state, local, and private interests to improve and modify the operations as circumstances dictate. The Corps will incorporate any commitments required by the appropriate regulatory agencies identified during the NEPA process.

4.26 Compliance with Federal Statutes, Executive Orders, and Policies

Compliance with Federal Statutes, Executive Orders, and polices has been considered for the three project alternatives. The following table includes a list of the various requirements and the compliance status for each of the alternatives.

Table 5. Relationship of Selected Alternatives to Environmental Requirements and Protection Statutes.

FEDERAL STATUTES	Alternative 1	Alternative 2	Alternative 3
Archeological and Historic Preservation Act as amended, 16 U.S.C. 469, et seq.	FC	FC	FC
Clean Air Act as amended, 42 U.S.C. 7401, et seq.	FC	FC	FC
Clean Water (Federal Water Pollution Control Act) as amended, 336 U.S.C. 1251, et seq.	FC	FC	FC
Endangered Species Act as amended, 16 U.S.C. 1531, et seq.	PC	PC	PC
Federal Water Project Recreation Act as amended, 16 U.S.C. 406-1 (12), et seq.	FC	FC	FC
Fish and Wildlife Coordination Act as amended, 16 U.S.C. 661, et seq.	PC	PC	PC
Land and Water Conservation Fund Act as amended, 16 U.S.C. 4601-4601-11, et seq.	FC	FC	PC
National Environmental Policy Act as amended, 42 U.S.C. 4321, et seq.	FC	FC	FC
National Historic Preservation Act as amended, 16 U.S.C. 470a, et seq.	FC	FC	FC
Rivers and Harbors Act, 33 U.S.C. 401, et seq.	FC	FC	FC
Coastal Zone Management Act of 1972, as amended, 16 U.S.C. 1451, et seq.	FC	FC	FC
Marine Mammal Protection Act of 1972, 16 U.S.C. 1361, et seq.	FC	FC	FC
Estuary Protection Act of 1968, 16 U.S.C. 1221, et. seq.	FC	FC	FC
Fishery Conservation and Management Act of 1976, 16 U.S.C. 1801-1882.	FC	FC	FC
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001, et seq.	FC	FC	FC
Wild and Scenic Rivers Act as amended, 16 U.S.C. 1271, et seq.	NA	NA	NA
Submerged Land Act of 1953, 43 U.S.C. 1301, et seq.	FC	FC	FC
Coastal Barrier Resources Act of 1982, 16 U.S.C. 3501, et seq. and Coastal Barrier Improvement Act of 1990.	FC	FC	FC

Andromous Fish Conservation Act, 16 U.S.C. 757a-757g, as amended.	FC	FC	FC
Marine Protection, Research and Sanctuaries Act, 33 U.S.C. 1401, et seq.	FC	FC	FC
Magnuson-Stevens Fishery Conservation and Management Act, as amended; 16 U.S.C. 1801 et seq.	FC	FC	FC
Farmland Protection Policy Act of 1981	FC	FC	FC
EXECUTIVE ORDERS, MEMORANDA, ETC.			
Floodplain Management (E.O. 11988)	FC	FC	FC
Protection of Wetlands (E.O. 11990)	FC	FC	FC
Protection of Children (E.O. 13045)	FC	FC	FC
Environmental Justice (E.O. 12898)	FC	FC	FC

FC - full compliance; PC – partial compliance: NA - not applicable